

REMARKS

Summary of the Amendment

Upon entry of the present Amendment, Claim 32 will have been amended. Accordingly, Claims 27-41 remain pending in the present application. Furthermore, Replacement Figures 3A and 5C have been submitted. By the present Amendment and Remarks, Applicant submits that the objections and rejections have been overcome, and respectfully requests reconsideration of the outstanding Office Action and allowance of the present application.

Summary of the Office Action

In the subject Office Action, Figure 11 has been objected to as failing to comply with 37 C.F.R. §1.84(p)(5). Claims 32-37 and 41 are rejected under 35 U.S.C. §102(e) as being anticipated; Claims 38-40 are rejected under 35 U.S.C. §103(a) as being unpatentable over art of the record; and Claims 27-31 are rejected under the judicially created doctrine of obviousness-type double patenting.

Objection to Drawings

The drawings are objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because Figure 11 includes reference “31” without the same being referenced in the description. The Examiner has requested corrected drawing sheets in compliance with 37 C.F.R. §1.121(d) or an amendment to the specification to add the reference character in the description in compliance with 37 C.F.R. §1.121(b).

Applicant would like to bring to the attention of the Examiner the Supplemental Preliminary Amendment filed by the Applicant on October 6, 2003. A copy of the Supplemental Preliminary Amendment has been included in the APPENDIX for the Examiner’s convenience. In that Amendment, on page 17, in the paragraph beginning on line 21 and ending on line 3, the twelfth line of such paragraph was amended to include the reference numeral “31” after the words “thermally conductive-adhesive layer”.

Accordingly, since the specification has already been amended to include reference numeral 31, Applicant respectfully requests that the Examiner withdraw the aforementioned objection to Figure 11.

Submission of Replacement Sheets for Figures 3A and 5C

Applicant has submitted Replacement Sheets with amendments for Figures 3A and 5C for the Examiner's consideration. The Figures have been amended to merely correct illustration errors and to make the Figures consistent with the disclosure of the originally filed specification. Applicant further certifies that no new matter has been added.

In particular, in Figure 3A, the dimples formed on the inner leads 12 (refer to paragraph [0061] of the specification) which function as lead lock 14 have been redrawn with a hidden line since Figure 3A is bottom plan view of the lead frame 10.

With regard to Figure 5C, the lugs 19b which protrude from the upper surface of each inner lead 12 (refer to paragraph [0061] of the specification) have been redrawn with hidden lines since Figure 5C is a bottom plan view of the lead frame 10. Furthermore, cross-hatching has been added to the wings formed on each inner lead 12 which function as the lead lock 14. It is noted that the cross-hatching is intended to be representative of surfaces of the lead 10 which have been partially-etched.

Accordingly, Applicant requests that the Examiner indicate approval of Replacement Figures 3A and 5C in the next Office Action.

Terminal Disclaimer

Claims 27-31 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-4 of U.S. Patent No. 6,448,633 to Yee et al.

Submitted herewith for the Examiner's consideration is a duly executed Terminal Disclaimer in compliance with 37 C.F.R. §1.321(c) in which Applicant has agreed to disclaim that term of any patent issuing in relation to the present application which extends beyond the expiration date of U.S. Patent No. 6,448,633 to Yee et al.

Accordingly, Applicant respectfully submits that the submission of the Terminal Disclaimer effectively overcomes the obviousness-type double patenting rejection advanced in relation to Claims 27-31.

Traversal of Rejection under 35 U.S.C. §102(e)

In re YAGI

Applicant respectfully traverses the rejection of Claims 32-36 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,201,292 to Yagi et al. [hereinafter “YAGI”].

The Examiner submits that YAGI discloses a semiconductor device (Figs. 7 and 12) that contains a flat paddle 24 having an upper surface that is partially etched which extends about the periphery, a plurality of leads 22 arranged adjacent to the paddle 24, at least some of the leads 22 each having a lower surface and a lead lock comprising at least one disk shaped protrusion (the circle shaped element in Fig. 12), a semiconductor chip 27 having a lower surface mounted on the paddle 24 by a thermally conducting adhesive 26, conductive wires 28 each electrically connecting respective ones of the leads 22 to the chip, a resin encapsulant 20 defining the bottom surface and at least partially encapsulating the chip 27, lead lock of the leads 22 and the conductive wires 28 wherein a portion of the lower surface of each of the leads 22 is exposed at the bottom of the encapsulant, a plating layer applied to a lower surface of the leads [bond pad(22b)], and a plurality of solder balls 30 being attached to the lower surface of the leads 22 and serving as an external input/output terminal.

A Review of YAGI

Figure 7 is a cross-sectional view of a resin-sealed semiconductor device 21' which includes a plurality of terminal portions 22 arranged two-dimensionally in two rows substantially on a plane and electrically independent of one another. A rectangular die pad 24 is disposed in a middle portion of the arranged terminal portions 22. The bottom surface of semiconductor element 27 is attached via an adhesive 26 onto a top surface of die pad 24. The terminal portion 22 includes an inner terminal 22A and an outer terminal 22B. The top of the inner terminal 22A includes a silver plating layer 23. Wires 28 electrically connect terminals 27a of the semiconductor element 27 to the terminals 22 at the silver plated portions 23. The terminal portions 22, the die pad 24, the semiconductor element 27 and the wires 28 are sealed by a sealing member 29 in such a manner that portions of the outer terminals 22B and the lower side of the die pad 24 are exposed to the outside. It is further

noted that the semiconductor device 21' is constituted by forming outer electrodes 30 of solder materials onto the exposed surfaces 22b of the outer terminals 22B of the semiconductor device 21'. This resin-sealed semiconductor device 21' is considered a ball grid array device (BGA).

Figures 11 and 12 of YAGI disclose a semiconductor device 41 which includes a plurality of terminal portions 42 arranged electrically independent of one another two dimensionally and substantially in a plane. A die pad 44 is disposed in a substantially middle portion of the arranged terminal portions 42. Die pad 44 has a rectangular surface configuration. *It is noted that a semiconductor element 47 is mounted via an adhesive 46 onto the lower surface of die pad 44. Therefore, the aforementioned embodiment shown in Figures 11 and 12 is different from the semiconductor package shown in Figure 7 because the semiconductor element 47 is mounted underneath the die pad 44 as compared to Figure 7 where the semiconductor element 27 is mounted on top of the die pad 24.* The terminal 42 has an inner terminal 42A and an outer terminal 42B. An upper surface 42a of each terminal 42 is provided with silver plating 43. The terminal portions 42, the die pad 44, the semiconductor element 47 and the wires 48 are sealed by a sealing member 49 in such a manner that the outer terminals 42B are partially exposed to the outside.

In re Independent Claim 32

Applicant's independent Claim 32 as amended recites, *inter alia*, . . . at least some of the leads each having a lower surface, an upper surface and a lead lock comprising at least one disk-shaped protrusion which is partially defined by the upper surface of the lead and includes a bottom surface positioned between the upper and lower surfaces of the lead; a semiconductor chip having a lower surface which is attached to the upper surface of the paddle;

On the other hand, YAGI does not teach the aforementioned features. In regard to Figure 7, it is noted that YAGI appears not to have any disk-shaped portion whatsoever. Rather, it appears the YAGI leads illustrated in Figure 7 have upright and flat opposing parallel sides as more clearly depicted in Figures 2 and 9. Furthermore, it is noted the circular-shaped portion of the YAGI lead 42 does not have, *inter alia*, . . . a bottom surface

positioned between the upper and lower surfaces of the lead; as is recited in Applicant's amended independent Claim 32.

And with regard to Figures 11-12, YAGI does not teach, inter alia, . . . a bottom surface positioned between the upper and lower surfaces of the lead; . . . as is recited in Applicant's independent Claim 32. Furthermore, YAGI does not teach, inter alia, . . . a semiconductor chip having a lower surface which is attached to the upper surface of the paddle; as is recited in Applicant's independent Claim 32. Instead, it is noted that in Figures 11 and 12, the YAGI die pad 44 is mounted above the semiconductor element 47.

For the foregoing reasons, because YAGI fails to disclose the above-noted features of the present invention, Applicant submits that YAGI fails to disclose each and every feature of the present invention as recited in Independent Claim 32.

Accordingly, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection under 35 U.S.C. §102(e) and that the rejection of Independent Claim 32 is improper and should be withdrawn.

Dependent Claims 33-36

Applicant further submits that dependent Claims 33-36 are allowable at least for the reason that these claims depend from allowable independent Claim 32 and because these claims recite additional features that further define the present invention.

Accordingly, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection under 35 U.S.C. §102(e) and that the present rejection of dependent Claims 33-36 is improper and should be withdrawn.

In re OKUMURA

Applicant respectfully traverses the rejection of Claims 37 and 41 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,942,794 to Okumura et al. [hereinafter "OKUMURA"].

The Examiner submits that OKUMURA discloses a semiconductor device (Fig. 11) that contains a flat paddle 102 that is partially etched about the periphery of the paddle 102, a

plurality of leads 104 arranged adjacent to the paddle 102, at least some of the leads 104 each having a lower surface and a lead lock 104a comprising inclined side walls having an increased width defined therebetween in an upward direction from the lower surface, a semiconductor chip 103 mounted atop the paddle 102, conductive wires 105 electrically connecting respective ones of the leads 104 to the chip 103 and a resin encapsulant 106 defining the bottom surface and at least partially encapsulating the chip 103, lead lock of the leads 104 and the conductive wires 105 wherein a portion of the lower surface of each of the leads 104 is exposed at the bottom of the encapsulant 106.

A Review of OKUMURA

Figure 11 of OKUMURA discloses a conventional single-sided plastic encapsulated semiconductor device. A semiconductor chip 103 is mounted on a die pad 102 of the lead frame 101. An electrode of the semiconductor chip 103 is electrically connected to inner leads 104 of the lead frame 101 via metal wires 105. The semiconductor chip 103, die pad 102, inner leads 104, and metal wires 105 are sealed with a sealing resin 106. Tip portions 104a of the inner leads 104 of the lead frame 101 are formed to have tapered profiles to exhibit sufficient adhesion to sealing resin 106. It is further noted that the tip portions 104a of the inner leads 104 are formed to have tapered profiles by mechanical or chemical processing.

Independent Claim 37

Applicant's independent Claim 37 recites, *inter alia*, . . . at least some of the leads each having a lower surface and a lead lock comprising inclined *side walls* having an increased width defined therebetween in an upward direction from the lower surface; . . . Applicant submits that OKUMURA does not teach the aforementioned features.

As shown in the Applicant's specification, the lead in Figure 4 has an inverted-trapezoidal cross-section. That is, each lead has inclined *side walls* serving as lead lock 14. Since each lead lock 14 has a tapered structure increasing in width as it extends inwardly from the bottom of the resin encapsulant 106, there is no possibility for the leads to be separated from the resin encapsulant 106 even when they receive cutting impact during a singulation process.

On the other hand, the prior art semiconductor device shown in Figure 11 of OKUMURA does not teach what is recited above in Applicant's independent Claim 37. In particular, OKUMURA does not teach, *inter alia*, each lead lock comprising inclined side walls having an increase width defined therebetween in an upward direction from the lower surface. *Instead, the OKUMURA inner leads 104 appear to have only one tapered side on the inner tip of the inner lead 104.* Thus, Figure 11 of OKUMURA does not teach an inclined side wall on both sides of the lead as is taught in the Applicant's invention recited in independent Claim 37.

For the foregoing reasons, OKUMURA fails to disclose the above noted features of the present invention. Therefore, Applicant submits that OKUMURA fails to disclose each and every feature of the present invention as recited in independent Claim 37.

Accordingly, Applicant submits that the Examiner has failed to establish an adequate evidentiary basis to support a rejection under 35 U.S.C. § 102(e) and that the rejection of independent Claim 37 is improper and should be withdrawn.

Dependent Claim 41

Applicant further submits that dependent Claim 41 is allowable for at least the reason that it depends from allowable independent Claim 37 and because Claim 41 recites additional features that further define the invention.

Accordingly, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection under 35 U.S.C. §102(e) and that the rejection of dependent Claim 41 is improper and should be withdrawn.

Traversal of Rejection under 35 U.S.C. §103(a)

Applicant respectfully traverses the rejection of Claims 38-40 under 35 U.S.C. §103(a) as being unpatentable over OKUMURA in view of YAGI.

The Examiner submits that OKUMURA discloses all the limitations recited in Claims 38-40 except for a plurality of solder balls and adhesive on the paddle and chip. The Examiner then contends that it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the device of OKUMURA by incorporating

solder balls to the end of the leads to form electrical connection to the outer circuit substrate as taught by YAGI.

Independent Claim 37

As discussed above, Applicant submits that independent Claim 37 is allowable because OKUMURA does not teach, *inter alia*, . . . at least some of the leads each having a lower surface and a lead lock comprising inclined side walls having an increased width defined therebetween in an upward direction from the lower surface; . . .

Applicant further submits that YAGI does not teach *inter alia*, . . . at least some of the leads each having a lower surface and a lead lock comprising inclined side walls having an increased width defined therebetween in an upward direction from the lower surface; . . .

Therefore, whether OKUMURA or YAGI are considered individually or in combination, and even if the aforementioned references are properly combined, the invention recited in independent Claim 37 still does not result from the Examiner's proposed modification of OKUMURA in view of YAGI.

Dependent Claims 38-40

Furthermore, for the foregoing reasons, Applicant submits that dependent Claims 38-40 are allowable at least for the reason that these claims depend from allowable independent Claim 37 and because these claims recited additional features that further define the present invention.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 38-40 under 35 U.S.C. §103(a) and indicate that these claims are allowable over the art of record.

Claims 27-31 are Allowable

In light of the Terminal Disclaimer submitted herewith this response, there are no current outstanding grounds of rejection with regard to Claims 27-41. On the basis of the foregoing, Applicant respectfully submits that Claims 27-41 are now in condition for allowance.

Application is Allowable

Applicant respectfully submits that each and every pending claim on the present invention meets the requirements for patentability and respectfully the Examiner to indicate allowance of such claims.

CONCLUSION

Applicant respectfully submits that each and every pending claim of the application meets the requirements for patentability and respectfully requests that the Examiner indicate the allowance of such claims.

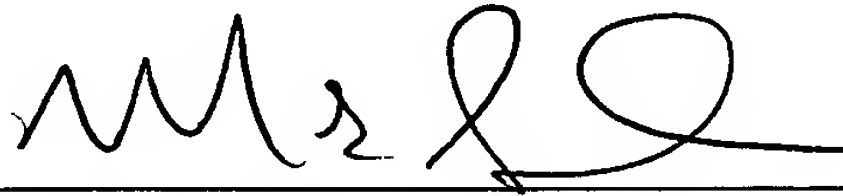
In view of the foregoing, it is submitted that none of the references of record when considered individually or in any proper combination thereof, anticipate or render obvious the Applicant's invention as recited in Claims 27-41. The applied references of record have been discussed and distinguished, while the significant claimed features of the present invention have been pointed out.

Further, any amendments to the claims which have been made in this response and which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

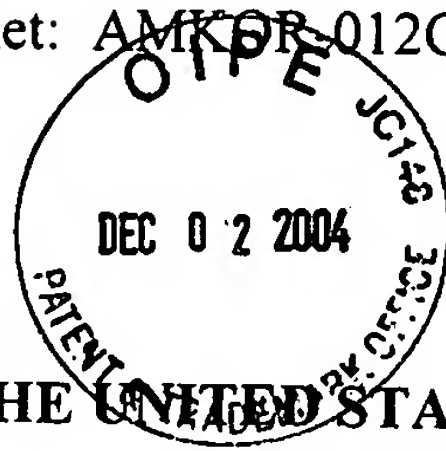
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Attorney Docket: AMKOR-012G1



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Jae Hak Yee et al.)	Confirmation No.	Unknown
Serial No.:	Unknown)	Art Unit:	Unknown
Filed:	Unknown)	Examiner:	Unknown
For:	Semiconductor Package and Method of Making Leadframe Having Lead Locks to Secure Leads to Encapsulant)		

SUPPLEMENTAL PRELIMINARY AMENDMENT

Mail Stop Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to the initial examination of the above-identified divisional patent application, please amend the application as follows:

Attorney Docket: AMKOR-012G1

Amendments to the Specification:

On page 8, line 29, please insert the following paragraph before the paragraph beginning with "FIG. 5E is a...":


FIG. 5D-1 is an enlarged view of the encircled portion of FIG. 5D;

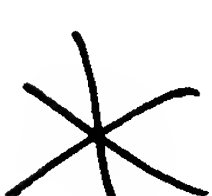
On page 11, please amend the paragraph beginning on line 6 and ending on line 9 as follows:

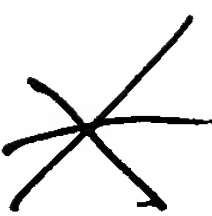
Dotted lines 23 inside the dam bars 17 represent singulation lines along which the lead frame 10' is cut after completing a semiconductor chip mounting process, a wire bonding process, and a resin encapsulate molding process. In Fig. 40A 1, the reference numeral 18 denotes side rails.

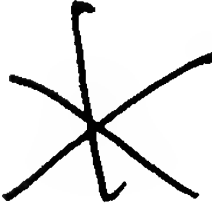
On page 14, please amend the paragraph beginning on line 19 and ending on line 25 as follows:


In the case of Fig. 5D, ~~Z-shaped~~ L-shaped wings extend from opposite side edges of each inner lead 12 at the inner end of the inner lead 12, respectively. Each wing has a partially etched structure in such a fashion that its lower surface has a higher level than that of the lower surface of the associated inner lead 12 to provide a lead lock 14. Further, facing L-shaped wings of adjacent leads are oppositely oriented. No wing is provided at the side edge of each inner lead 12 arranged adjacent to an associated one of the tie bars 15. However, this is not construed to limit the present invention. Also, although the wings have a Z L shape, they may have other shapes.

 On page 17, please amend the paragraph beginning on line 21 and ending on line 3 of page 18 as follows:

 The semiconductor package 1 of Fig. 7C has the same basic configuration as that of Fig. 7A. Accordingly, no description will be made for the same basic configuration. In the case of Fig. 7C, an insulating material such as polyimide is uniformly coated over the entire lower surface of the semiconductor chip 2 using a well-known process such as a spin

 coating process, a duct blade process, a spraying process, a dispensing process or a printing process. The coated layer is then set at a high temperature. Practically, the insulating material is coated over a wafer (not shown) including a plurality of semiconductor chips 2. Accordingly, a sawing process is carried out to separate the wafer into package units respectively including individual semiconductor chips 2 each coated with the insulating layer 32 over the entire lower surface thereof. Each semiconductor chip 2 is then mounted on the paddle 16 of a lead frame having a configuration according to the present invention by means of a well-known thermally conductive-adhesive layer 31. In the case of FIG. 7C, accordingly, the inner end of each lead 11 is maintained not to come into direct contact with the lower surface of the semiconductor chip 2. As a result, there is no problem such as a short circuit or electric leakage even when the semiconductor chip 2 is bonded to the paddle 16 without keeping its accurate horizontal position or when a lead sweeping phenomenon occurs during a molding process.





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On page 18, please amend the paragraph beginning on line 28 and ending on line 2 of page 19 as follows:

Fig. 8 is an enlarged view corresponding to a portion A of Fig. 7D. Referring to Fig. 8, a configuration capable of accomplishing the fifth object of the present invention will be described. Fig. 8 illustrates a cross-section of a structure obtained after cleaning the solder ball lands 19a by removing the lower portion of each protrusion 19, exposed at the bottom of the resin encapsulate 4 in the semiconductor package 1, to a desired depth and over a desired area, selectively plating a metal 35 such as gold and/or nickel, and/or aluminum, or an alloy thereof on the cleaned solder ball lands 19a and then fusing solder balls 5, as external input/output terminals, on the plated solder ball lands 19a.

Attorney Docket: AMKOR-012G1

Amendments to the Drawings:

Submitted herewith for the Examiner's consideration is a separate document captioned "Request to Amend Drawings and Submission of Formal Drawings" wherein Applicant has amended Figures 5D, 7C and 8, added new Figure 5D-1 and submitted formal versions of Figures 1, 2, 3A, 3B, 3C, 3D, 4, 5A, 5B, 5C, 5D, 5D-1, 5E, 6A, 6B, 7A, 7B, 7C, 7D, 8, 9, 10A, 10B, and 11.

Attorney Docket: AMKOR-012G1

REMARKS

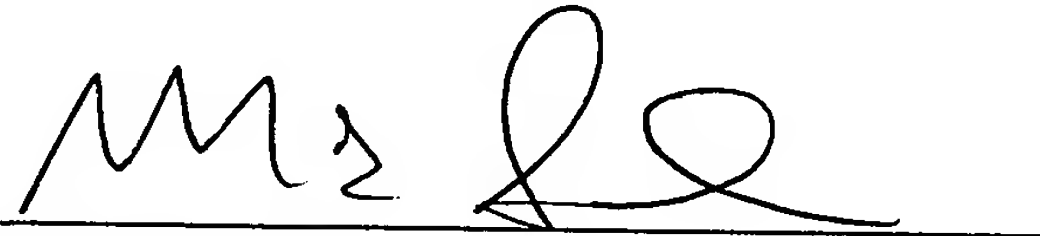
By the foregoing supplemental Preliminary Amendment, Applicant has made changes to the specification and drawings of the present application consistent with those effectuated by Applicant's Response to Office Action and Request to Amend Drawings filed June 8, 2001 in relation to the parent application Serial No. 09/444,035, which issued as U.S. Patent No. 6,448,633 on September 10, 2002.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

Date: 10/6/03

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